

ECOREGION Iceland and East Greenland
STOCK Saithe in Division Va (Icelandic saithe)

Advice for 2013

ICES advises on the basis of the MSY approach (B-rule) that catches in 2013 should be no more than 49 000 t.

Stock status

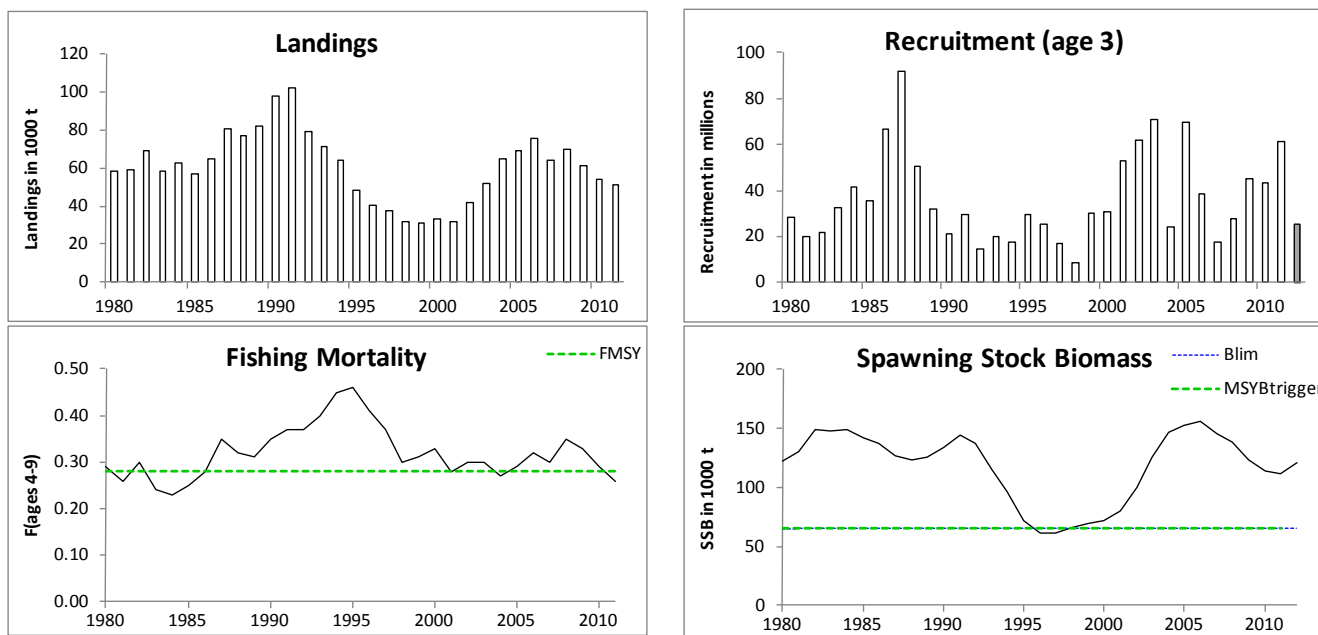
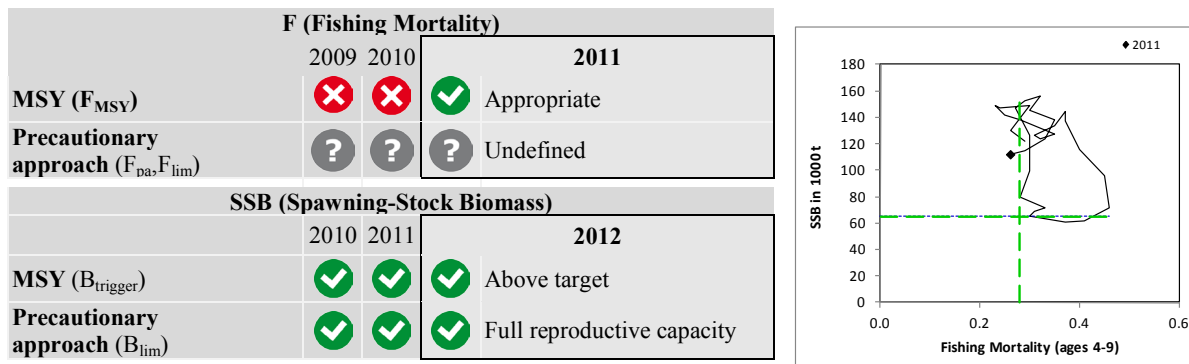


Figure 2.4.4.1 Saithe in Division Va (Icelandic saithe). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

The fishing mortality has fluctuated around 0.3 between 1998 and 2011, decreasing from around 0.4 in the mid-1990s. SSB has been declining since 2006 and is at present close to the long-term average. Year classes 1998–2000 and 2002 were large, but recruitment since then has been around the long-term average, except for the 2008 cohort which is estimated to be large.

Management plans

A management plan in accordance with the MSY approach is under development and will likely be put into force this year.

Biology

Saithe is a migrating fish and makes both feeding and spawning migrations. The evidence from tagging experiments (ICES, 2008) shows some migrations along the Faroe–Iceland Ridge, as well as onto the East Greenland shelf.

Environmental influence on the stock

Icelandic saithe is near the northern boundary of its distribution, and a relatively small part of the stock inhabits the waters off the northern and eastern coasts of Iceland, except in warm years. The fishery and the survey show a more northerly distribution in recent years, possibly because of relative warming in the northern waters. Significant changes in the length- and weight-at-age have been observed in the Icelandic saithe. It is unknown whether these changes are fisheries or environmentally driven.

The fisheries

Saithe are caught in directed saithe fisheries, as well as in mixed demersal fisheries targeting cod. The fishery is regulated by TACs and minimum mesh size in fishing gears.

Catch distribution Total landings (2011) are 51 kt, where 80% were caught by bottom trawl and 7% by gillnet, with jiggers and Danish seine taking the majority of the rest. 1–2% discards by numbers.

Quality considerations

The assessment of Icelandic saithe is relatively uncertain due to fluctuations in the spring survey data. This produces high uncertainty in the present estimates of SSB and fishing mortality.

An issue in this year's assessment involves the 2008 cohort which is estimated to be large by the default assessment model, and this increases the biomass estimate compared to recent years. However, the size of the 2008 cohort is very uncertain, due to mixed signals about this cohort in the commercial and survey catch-at-age data.

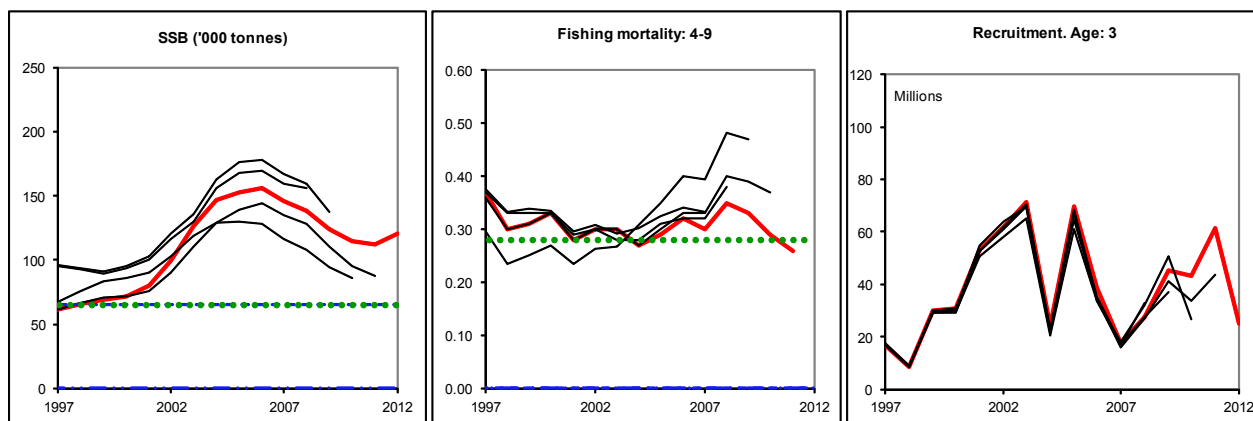


Figure 2.4.4.2 Saithe in Division Va (Icelandic saithe). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Separable statistical catch-at-age model, with changes in selectivity for three different time periods.
Input data	Catch-at-age and spring groundfish survey.
Discards and bycatch	Not included in the assessment, estimated to be very low.
Indicators	None.
Other information	Benchmark performed in 2010.
Working group report	NWWG

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY $B_{trigger}$	65 000 t	Stochastic projections based on hockeystick S–R function.
	F_{MSY}	0.28	Stochastic projections based on hockeystick S–R function.
Precautionary Approach	B_{lim}	65 000 t	B_{loss} estimate in 2010.
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	Not defined	

(MSY $B_{trigger}$ corrected in 2012, technical basis is the same as in 2010 corrected in 2012)

Outlook for 2013

Basis: $F(2011) = 0.26$; $F(2012) = 0.24$ based on landings 2012 = 52; $SSB(2013) = 130$; $B_{4+}(2013) = 259$; $N_3(2012) = 25$ from assessment model.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change ¹⁾	% TAC change ²⁾
Zero catch	0	$F=0$	0.00	180	38	–100
MSY framework B-rule ³⁾	49	20% HCR	0.22	143	9	–6
<i>Status quo</i>	57	$F = F_{2011}$	0.26	137	5	10
MSY framework F-rule	61	$F = F_{MSY}$	0.28	134	2	17

Weights in thousand tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

²⁾ Landings 2013 relative to TAC 2012.

³⁾ Average of 0.2 B_{4+} and last year's advice.

MSY approach

Given that the harvest rate of 20% of B_{4+} is more robust to changes in selectivity, ICES bases its advice on the B-rule (Figure 2.4.4.5).

Following the ICES MSY framework (B-rule) implies that the TAC is based on the average of 20% of the reference biomass in 2012 and last year's advice (2011). This implies that the TAC should be no more than 49 000 t.

Additional considerations

Management considerations

Analysis of the Icelandic saithe data (NWWG, 2012; ICES, 2010) indicates considerable changes in selectivity, and the $F_{MSY} = 0.28$ is based on the selectivity pattern estimated in 2010. The currently estimated selectivity targets younger fish, and simulation analysis with this selectivity would lead to a different F_{MSY} .

The spring survey data are relatively noisy and have therefore led to considerable fluctuations in retrospective biomass estimates.

Given the aforementioned changes in selectivity, as well as the fluctuations in the spring survey data, the B-rule with a two-year stabilizer reduces the probability of giving advice that leads to temporary overfishing or underutilization.

Information from the fishing industry

Commercial cpue from the most important fleets targeting saithe are available for 20 years or more. However, the potential for bias in commercial cpue (for example hyper-stability) is a serious concern for shoaling species such as saithe. Therefore, although these indices have been explored for inclusion in the past, they were not considered in calibrating the present assessment, as they are considered unreliable as an indicator of abundance.

Uncertainties in assessment and forecast

The Icelandic discards monitoring programme has not detected large amounts of discards in the saithe fishery. Excluding discards in the assessment is thus not considered to cause a significant bias in the assessment and the advice.

The assessment is relatively uncertain, due to high variances in survey measurements and lack of reliable recruitment estimates.

The discrepancy between the applied assessment model and a TSA model (NWWG, 2012) is greater than in recent years, estimating the total biomass (B4+) as 265 kt and 219 kt, respectively. This difference is mainly due to uncertainty about the 2008 cohort. Next year's data should decrease this uncertainty about the 2008 cohort size. If the 2008 cohort does not turn out to be large, then the current biomass estimate of 265 kt is most likely an overestimate.

Comparison with previous assessment and advice

In the current assessment, SSB in 2011 is estimated 27% higher and F in 2010 is estimated 22% lower than in last year's assessment.

This year's advice is based on the MSY framework B-rule. Last year's advice was based on the F-rule.

Sources

ICES. 2008. Report of the North-Western Working Group (NWWG). ICES CM 2008/ACOM:03.

ICES. 2010. Report of the Benchmark Workshop on Roundfish (WKROUND). ICES CM 2010/ACOM:36.

ICES. 2011. Report of the North-Western Working Group, 26 April–3 May 2011. ICES CM 2011/ACOM:07.

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

NWWG. 2012. Gudmundur Gudmundsson. Fish stock assessment by time-series analysis. North-Western Working Group, WD 27.

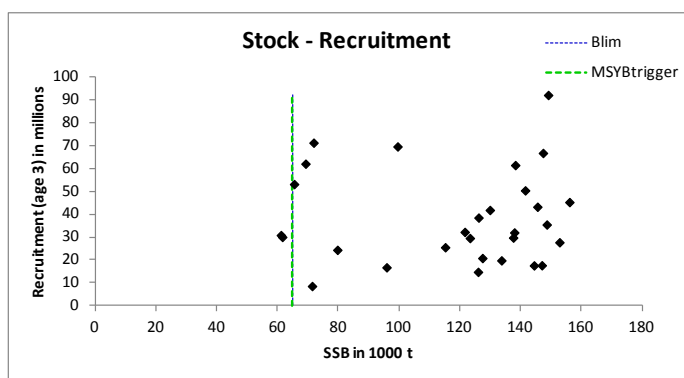


Figure 2.4.4.3 Saithe in Division Va (Icelandic saithe). Stock–recruitment plot.

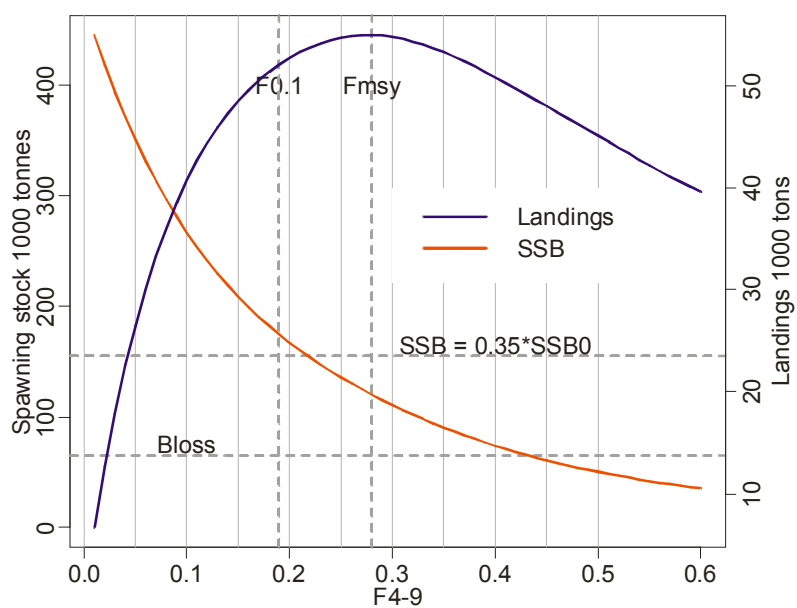


Figure 2.4.4.4 Saithe in Division Va (Icelandic saithe). Yield and SSB as a function of F_{4-9} , based on stochastic simulations from the WKROUND benchmark (ICES, 2010).

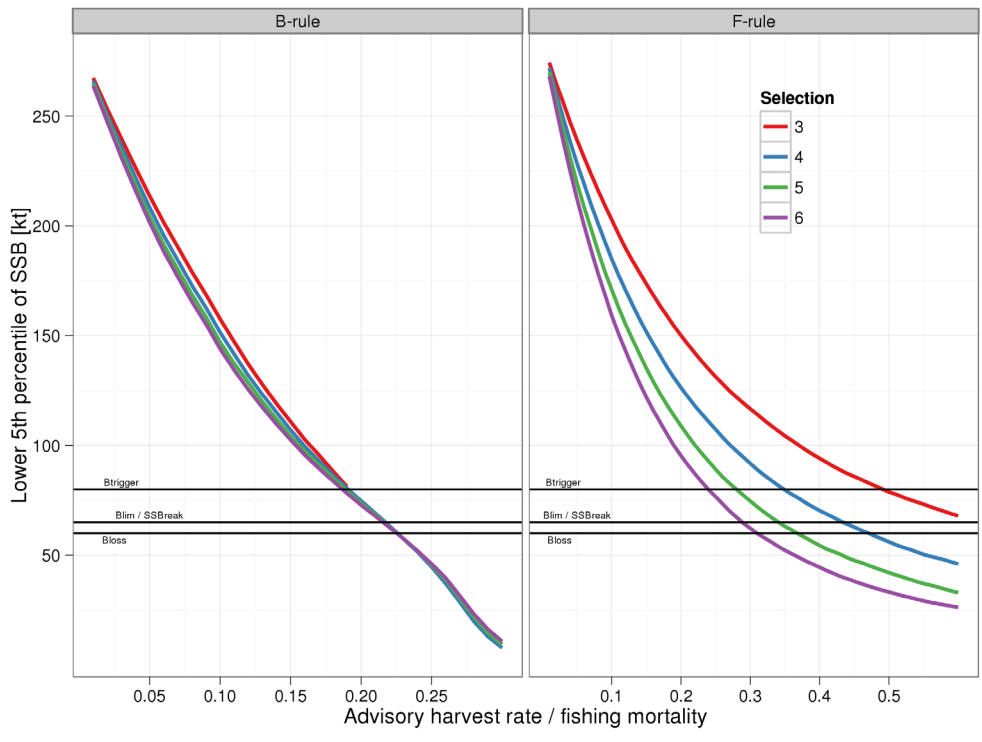


Figure 2.4.4.5 The lower 5th percentile of the spawning-stock biomass based on four arbitrary selection patterns, where higher scenario numbers reflect increasing targeting of younger fish. The left hand panel shows the outcome of the SSB when advice is based on the reference biomass (B4+). The right hand panel the shows outcome of the SSB when the advice is based on the conventional F-based rule.

Table 2.4.4.1 Saithe in Division Va (Icelandic saithe). ICES advice, management, and catches.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Landings
1987 ¹	TAC	64	70	81
1988 ¹	TAC	64	80	77
1989 ¹	TAC	80	80	82
1990 ¹	TAC	80	90	98
1991 ¹	TAC	87	65	71
1991/92 ²	TAC	70	75 ²	88
1992/93 ²	Marginal gains from increase in F	75 ¹	95 ²	78
1993/94 ²	No measurable gains from increase in F	84 ¹	85 ²	69
1994/95 ²	No measurable gains from increase in F	72 ¹	75 ²	61
1995/96 ²	No measurable gains from increase in F	65 ¹	70 ²	41
1996/97 ²	No measurable gains from increase in F	52 ¹	50 ²	38
1997/98 ²	F below $F_{med} = 0.23$	30 ³	30 ²	33
1998/99 ²	F below 60% of F(97)	28	30 ²	32
1999/00 ²	F below 60% of F(98)	24	30 ²	30
2000/01 ²	F=70% of F(99)	25	30 ²	32
2001/02 ²	No directed fishing	-	37 ²	36
2002/03 ²	2/3 F_{pa} to rebuild stock	24	45	47
2003/04 ²	No advice		50	56
2004/05 ²	F_{pa}	69	70	71
2005/06 ²	F_{pa}	78	80	78
2006/07 ²	F_{pa}	81	80	66
2007/08 ²	No advice	-	75	68
2008/09 ²	Maintain $SSB > B_{pa}$	< 22	65	62
2009/10 ²	F reduced below 0.22	< 34	50	54
2010/11 ²	F_{MSY}	< 40	50	51
2011/12	F_{MSY}	≤ 45	52	
2012/13	MSY framework [B-rule]	≤ 49		

Weights in thousand tonnes.

¹Calendar year.²National fishing year ending 31 August.

Table 2.4.4.2

Saithe in Icelandic waters (Division Va). Summary of the assessment.

	B4+	SSB	Landings	Landings/B4+	F4-9	N3	Cohort
1980	312	122	58	0.19	0.29	28	32
1981	305	130	59	0.19	0.26	20	42
1982	294	149	69	0.23	0.30	22	35
1983	270	147	58	0.22	0.24	32	67
1984	287	149	63	0.22	0.23	42	92
1985	299	142	57	0.19	0.25	35	50
1986	318	138	65	0.20	0.28	67	32
1987	335	127	81	0.24	0.35	92	21
1988	416	123	77	0.19	0.32	50	30
1989	398	126	82	0.21	0.31	32	15
1990	378	134	98	0.26	0.35	21	20
1991	336	144	102	0.30	0.37	30	18
1992	288	138	80	0.28	0.37	15	30
1993	231	115	72	0.31	0.40	20	26
1994	187	96	64	0.34	0.45	18	17
1995	153	71	49	0.32	0.46	30	9
1996	149	62	40	0.27	0.41	26	30
1997	156	61	37	0.24	0.37	17	31
1998	153	66	32	0.21	0.30	9	53
1999	131	69	31	0.24	0.31	30	62
2000	142	72	33	0.23	0.33	31	71
2001	161	80	32	0.20	0.28	53	24
2002	216	100	42	0.19	0.30	62	70
2003	274	126	52	0.19	0.30	71	38
2004	315	147	65	0.21	0.27	24	18
2005	279	153	69	0.25	0.29	70	28
2006	301	156	76	0.25	0.32	38	45
2007	267	146	64	0.24	0.30	18	43
2008	234	138	70	0.30	0.35	28	61
2009	211	124	61	0.29	0.33	45	25
2010	219	114	54	0.25	0.29	43	
2011	234	112	51	0.22	0.26	61	
2012	265	121				25	
Average	258	118	61	0.24	0.32	36	36

The table shows official landings, based on data from the Icelandic Directorate of Fisheries. The difference between the official data (51 123 t in 2011) and ICES data (51 215 t) is less than 0.2%.